THE INSTITUTE OF PHYSICS

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BULLETIN

No. 30 *Information in this circular is not intended for general publication: your copy should not therefore be passed to a library.* JUNE 1952

NOTICE TO MEMBERS

Journal Back Numbers

The Institute is urgently in need of a few copies of each of the back numbers of the *Journal of Scientific Instruments* listed below.

Five shillings each will be paid for the following:—

Volume 26	1949	Part 3 and 9.
Volume 28	1951	Parts 5, 7 and 11.

Ten shillings each will be paid for the following:—

Volume 17	1940	Part 10.
Volume 18	1941	Parts 1, 2, 3, 4, 5 and 9.
Volume 19	1942	Parts 1, 4, 5, 8, 9 and 12.
Volume 20	1943	Parts 2 and 3.
Volume 22	1945	Part 1.
Volume 23	1946	Parts 1, 4, 9 and 12.
Volume 24	1947	Parts 1, 3 and 6.

EDUCATION GROUP CONFERENCE

The photograph, taken by Mr. F. H. Tyler (Associate), shows a group of members who attended the Education Group Conference in April. At the front are (left to right) Dr. N. Pentland, Mr. W. B. Chivers, Dr. J. Topping, Mr. W. Somerville Vernon, Mr. G. R. Noakes, Mr. S. N. Ray and Miss T. J. Dillon. About 80 persons attended the Conference, the proceedings of which are summarized by Dr. M. R. Gavin in this issue of the *Bulletin*.

EDUCATION GROUP: ANNUAL CONFERENCE, 1952

The annual conference of the Institute's Education Group was held at the Institute's House on 17th to 19th April, 1952. The subject was "School and University Examinations in Physics." The following account has been prepared by Dr. M. R. Gavin, F.Inst.P.

The opening paper of the conference was by MR. J. L. BRERETON, General Secretary, University of Cambridge Local Examinations Syndicate, who made a general survey under the title "The Place of Examinations in Education." He dealt with two main divisions of learning: (*a*) the acquiring of knowledge, and (*b*) the acquiring of skill. He said that there is general agreement on the value of examination of skills in most subjects, and the majority of responsible people do not dispute the value of testing knowledge of science subjects. Mr. Brereton asserted that there is value in the acquisition and assessment of true knowledge of any subject. He proceeded to deal with the nature of examinations, their objectives and effects, the different forms they take, and some of the difficulties associated with them. He contrasted the traditional type of lengthy written examination with the modern objective test, used extensively in the U.S.A., and mentioned that there is evidence which seems to indicate some correlation between the results of the two types of test. He said that he favours tests of knowledge being at a fairly low level, with severe marking, as this minimizes to some extent the effects of widely varying standards of teaching. Mr. Brereton regretted the modern tendency, exemplified in the General Certificate of Education, to make examinations more external to the schools. He favoured the granting of more freedom to schools of recognized quality, and emphasized that teaching and learning are much more important than examinations.

In the course of a full and animated discussion many differing points of view were expressed, but there was fair unanimity about the inferiority of the General Certificate of Education to the School Certificate. The objective test was claimed by some to give a more reliable assessment of potentialities and was welcomed by others for its lightening of the examination burden on students. Mr. Brereton added that we should remember that the shortcomings of conventional tests are well known and those of the newer methods have still to be discovered. Several speakers wanted examinations to test ability to acquire knowledge as well as to test knowledge itself.

The second session of the Conference was devoted to School Examinations and was introduced by DR. T. L. IBBS, of Birmingham University, who is concerned with the selection of students for University courses. For this purpose he regretted the passing of School and Higher School Certificate examinations. These were tests of a broad education and the pass, credit and distinction were of great help in classifying University applicants. Dr. Ibbs indicated a preference for conventional tests of acquired knowledge rather than intelligence tests. He drew attention to the wide variations in the numbers of education grants made to students by the different local authorities. He quoted Ministry of Education figures which showed that the number of grants per 10 000 students ranged from 2 to 75 in different parts of the country. He concluded by referring to the G.C.E. Advanced Level syllabuses in Physics of the Northern Universities Joint Board. Part One covers the basic minimum which must be done thoroughly. Part Two offers a wide choice of more advanced, or more modern subjects.

MR. E. W. TAPPER, Dulwich College, followed with a description of the nature of the examinations in physics in his own school. One examiner is responsible for each stage and the papers include essay questions, the intelligence type of question, and the conventional three-part question with definition, problem and calculation. The results are studied statistically and the boys are grouped into four categories of attainment. Classifications into pass and fail are avoided as far as possible. Mr. Tapper emphasized that teaching and learning are much more important than examinations but he did claim that it is desirable to train boys in the technique of examinations.

The last paper of this session was by MR. W. B. CHIVERS, King Edward's Grammar School, Aston, Birmingham. He dealt with Practical Examinations. He listed as follows the qualities which such an examination should test: (i) observational ability, (ii) technique of recording, (iii) application of theory, (iv) resourcefulness, (v) ability to use graphical methods, (vi) ability to conclude with a critical mathematical analysis. Mr. Chivers averred that few practical examinations fulfil these requirements. He advocated the following reforms: (i) increasing the proportion of marks for Practical Physics to one-third of the total, and separate recording of passes, (ii) separate practical tests for advanced and scholarship levels, (iii) higher overall standard, and (iv) separate assessment of practical work by the tutor. Mr. Chivers concluded with a helpful and amusing list of "Don'ts for Examiners."

Both examiners and teachers were well represented in a lively discussion. In spite of the widely varying points of view there was fairly general agreement on some issues. The great difficulties associated with practical examinations were emphasized and some speakers advocated the discontinuance of the external practical test. At the same time there was unanimity on the need to ensure that adequate time is devoted to practical work. Several people criticized the Northern Universities Joint Board's second paper in the Advanced Level examination, chiefly on the grounds that it encourages narrow specialization and results in the omission of important basic parts of the subject. There was also some consensus of opinion on the unsatisfactory nature of General Science as a subject which, it was stated, produces students with loose information and a slip-shod attitude. Success in teaching physics in accordance with the Dalton Plan was claimed.

"University Examinations for Honours Students of Physics" formed the subject for the third session. The first paper was by PROFESSOR W. E. CURTIS, King's College, Newcastle-upon-Tyne, President of the Institute. Professor Curtis considered examinations in the provincial universities under two main headings, (*a*) their influence on the general course work, and (*b*) their effectiveness in assessing the relative merits of students. He considered that examinations usually laid too much stress on memory and lecture notes at the expense of thinking and purposeful reading. Too frequently practical examinations test merely the ability to repeat an experiment already done, instead of the ability to plan an experiment, to execute it with sufficient accuracy and to present the required

results clearly and concisely. In spite of these shortcomings Professor Curtis claimed that on the whole examinations give a sound classification of the students. He advocated the division of the second class honours group into two sections. Professor Curtis made a number of recommendations for improving the effects of examinations on the course work. Problem questions involving real thought should be set in addition to the purely descriptive questions, and these should be segregated in a separate paper. In addition credit should be given for "report" or "essay" tasks carried out during the course or in the vacation. Practical tests should involve problem experiments conducted over a period of two days or more.

The second contribution to the subject of University Examinations was from DR. J. G. WILSON, of Manchester University. He considers that the final examination is essentially for the purpose of providing each candidate with a professional label. The value of the label does not last, but it does determine the initial entry to the profession and it is therefore extremely important that the examination should fix the correct label. A good physicist should (i) have knowledge of past work or know how to find it, (ii) be capable of some measure of original thought, and (iii) be able to pass on his conclusions with sufficient clarity. The second of these requirements differentiates individuals most strongly, but it is difficult to test. Most examinations test acquired knowledge. Dr. Wilson suggested that examinations could be made better tests of the desirable qualities, without radical change, provided that the examiner paid careful attention to the setting of the papers. He suggested that a certain basic range of knowledge, including some numerical quantities, should be assumed and that the questions should omit data belonging to that range. Other qualifications which do away with the need for judgment should be avoided. Whenever appropriate, numerical answers should be in practical units, as these involve understanding as well as knowledge. The papers should be carefully surveyed to ensure that high marks cannot be obtained from limited knowledge.

In the discussion several people referred to the low standards of English shown by science students. Various remedies were put forward, including more reading of good literature and the introduction of formal examinations in "English for Scientists." On the question of testing ability to think, it was suggested that more weight should be given to oral examinations. Speakers with experience of both written and oral examinations declared in favour of the latter, provided that the examiner is sufficiently skilful.

The final session opened with a paper by DR. A. J. WOODHALL, Military College of Science, Shrivenham, on the subject "Examinations in Physics for Non-Specialists." Dr. Woodhall began with a statement of some of the principles which should be kept in mind in setting any examination: (i) questions should be searching and of comparable standard, (ii) "new problems" should be used with care as there is a large element of chance in them, (iii) papers should ensure a reasonable spread in the results, (iv) questions should be criticized by an independent moderator. In conventional papers for non-specialists, physicists frequently err in trying to give an engineering, chemical or biological background to the questions in the physics paper. In principle this is all right, but in practice the questions are frequently unnatural. On the whole it is preferable to keep to basic physics in conventional examinations. Dr. Woodhall concluded with a brief description of some unconventional tests which have been tried successfully with non-specialists in his own college. The examinations consist of solving problems in the form of projects and are mainly experimental. Written reports on the work done are an important part of the tests. Students are allowed to bring notes to the examination.

In the discussion reference was made to the unpopularity of the non-specialist. The importance of rousing his interest and confidence was stressed, and to this end he should be treated separately from the specialist, whenever possible.

The conference concluded with a paper on "University Practical Examinations" by DR. W. H. TAYLOR, Cavendish Laboratory, Cambridge. He enumerated the qualities that such tests should assess, (i) skill and not memory, (ii) knowledge of other people's work, (iii) appreciation of the capabilities of equipment, (iv) understanding of sources of errors and their reduction, (v) knowledge of what kind of answer is reasonable, (vi) ability to record and report properly. Dr. Taylor expressed doubt about the value of a single practical test in assessing these qualities and in classifying students. Diversity of experiments also makes classification difficult. He concluded with an account of the procedure in the practical examination of the Part 2 Tripos at Cambridge. The examination takes one day with no interval and students supply their own refreshments. All tackle a common problem which is explained in detail at the beginning. Difficulties are pointed out and necessary formulae are supplied. The students record an outline of their method of attack before doing any experimental work. During the examination demonstrators answer any questions but appropriate penalties are incurred. The final mark for practical work is based not only on the examination but also on performance throughout the course.

In the discussion, the setting of a number of small practical tests was recommended as an alternative to one large experiment. As in the discussion on practical examinations in schools, it was obvious that many speakers considered that practical examinations as such should be discontinued. In this connection there was some discussion on the relative performance in the written and practical tests. The correlation was claimed to be fairly high but not sufficiently close to justify making awards on theory alone.

Gases indeed appear to exist chiefly to give experts in statistical mechanics and the mathematical theory of probability an opportunity to appease their hunger for calculation.

E. T. BELL.

NEW BOOKS

The Scientific Adventure. By HERBERT DINGLE. (London: Sir Isaac Pitman and Sons Ltd.) Pp. 372. Price 30*s*.

There are many loud assertions of the inability of science students to express themselves in clear English. Not the least virtue of this book is that it is a model of the use of English in presenting scientific knowledge and speculation. Professor Dingle has a style which is lucid and precise; his book can be recommended to anyone who finds difficulty in the use of English and also to those who make a fetish of "functional" English (or any other variant of the language).

The volume is a collection of essays and addresses published or delivered at various dates between 1937 and 1950. Some of them were first addressed to groups of specialists but others were delivered to more general audiences. The first essay in the book was written as Professor Dingle's inaugural lecture as Professor of History and Philosophy of Science at University College, London. In it he makes a plea for the creation of a critical school, performing for science the function which criticism has performed for literature.

The remaining nineteen essays are in two groups—eight historical and the remainder philosophical. Of the historical essays two are biographical (on Copernicus and Galileo) and four are astronomical or cosmological. The remaining two are "Some reflections on the history of science," a discussion of the contrast between the historical and logical lines of scientific development, and "Physics in the eighteenth century," a period which Professor Dingle describes as "the springtime of modern physics, when something new appeared every day and the man who had a mind for such things could take his pleasure where he would."

The philosophical essays are of great interest. "The philosophical view-point of the scientist" and "The nature of scientific philosophy" are, perhaps, a little heavier-going than the earlier essays, but they are rewarding. "Science and the Unobservable," a Royal Institution Friday evening Discourse, discusses the concept of simultaneity and the classification of the unobservable into "practically," "humanly," "physically" and "logically" unobservable. Professor Dingle concludes that "anyone who regards the recent trend of physics in general, and the theory of relativity in particular, as legitimate science or philosophy or intellectual activity, . . . must either be an idealist or presume he is omniscient. . . . if we adopt an idealist view that the universe is constructed mentally by logical inference from experience, we see the implication of modern physics as simply the traditional thesis of science that the data we choose shall be pure experience, unalloyed with fancy or arbitary dogma." This essay is a brilliant popular presentation of a difficult subject.

The last two essays in the book are "Science and Ethics" and "Science and Religion." Professor Dingle asserts the validity of science and religion in their own spheres; his attitude to religion seems, to a Christian, to be singularly sympathetic and understanding. "A religious man," says Professor Dingle, "has just as much justification for creating a world-picture that will interpret his religious experience as the physicist has for creating a world-picture that will interpret his sensory experience. Each becomes wrong when he condemns the work of the other (and infinitely wrong when he denies the experience from which it arises) on the grounds that it would be of no use for his own problem. If a man finds that a conception of a personal God with certain attributes gives a simple and trustworthy interpretation of certain elements of his experience, he is not only justified, he is acting perfectly scientifically in adopting it." Again "the chief error of scientists has been to condemn as illusory all experience which is not useful for their restricted purposes." No Christian, be he scientist or not, is likely to quarrel with that and a good many will endorse the opinion that "a theology which is to stand the test of time must extend as far as, and no farther than, the human experience which has called it forth." The essay is objective—it is not, I think, based on indifference.

"Science and Ethics" is to me, astonishingly negative. In other essays Professor Dingle has clearly expressed his view that a philosophy should be all-embracing and firmly grounded in experience. For example (p. 197), "what distinguishes the philosopher properly so called from the ordinary man is that he desires not only to make such rationalization of his experience as will meet his elementary needs, but to rationalize the *whole* of his experience" or (p. 203), "The peculiar characteristic of scientific philosophy may be expressed in this way. Like all philosophy, its aim is to organize the whole of experience into a rationally connected system, but, unlike all previous philosophies, it does not accept the world of material objects, located and moving in a unique space and time, as a necessary starting-point, but goes back to the original experiences that led to the conception of that world for practical ends." Yet, apparently, from a scientific philosopher so defined, no guidance is forthcoming upon what Professor Dingle calls "the most fundamentally important thing in our lives"—the problem "how shall I choose what to do?" He leaves us in no doubt of his emphatic negativeness. "I am not among those" (he says) "who regard ethics as a department, or even a possible department, of science." Most of us would agree with that. But now comes the serene negation. "It is not because I have some other kind of solution of the ethical problem to offer. I have none: . . . As to how it can be solved, I have no suggestions to offer." He accepts as "an inescapable fact" that the basis of morality is "a matter of caprice." We may legitimately ask whether Professor Dingle, lacking (it would seem) experience that can create for him a "categorical imperative," personally accepts any foundation of ethical behaviour and, if so, what particular "caprice" determined his choice. Is he content that we, like Johnson, should count the spoons? In the world of space that is finite yet unbounded our scientific adventurer is vocal and confident; in the other world that includes napalm bombs, refugee children and concentration camps he can say nothing of what we *ought* to do. "Caprice" is all he has to offer. If this were the state to which scientific philosophy led all its devotees, one could only hope for a revival of classical education. Fortunately for our troubled world, there are some scientific adventurers who are more venturesome and less capricious than Professor Dingle.

N. CLARKE

Science and the Christian Man. By CHARLES E. RAVEN. (London: Student Christian Movement Press.) Pp. 60. Price 4*s*. 6*d*.

Although this work was first delivered as a series of broadcast lectures, it is well worth reading in book form since the lines of thought are so closely reasoned as to merit re-reading more than once. As the book is a highly condensed summary of the fundamentals of Christian thought, it cannot be summarized in a review, but its scope can be indicated. The author outlines the ideas of religious experience, of Godhead and of the Trinity, in language which gives us some

idea of his inspiration without departing from the clarity of the ideal scientific thinker. If you are repelled by the statement that "this awareness of the universe and the joy and humility that accompany it, if in its primitive form it is the distinctive novelty which separates man from the beasts, is also at the higher levels of human achievement the source of inspiration for the artist, the thinker, and the saint!" then you will find the book annoying to read. For the reviewer its chief value has been the light it throws on the balance between experience and faith in man's effort to integrate his values.

E. VAN SOMEREN

Marx and Science. By J. D. BERNAL, F.R.S. (London: Lawrence and Wishart Ltd.) Pp. 56. Price 2*s.* 6*d.*

Professor Bernal shows how Marx, influenced by Hegel and Feuerbach and later by Engels, developed his concepts of dialectical materialism and became absorbed "in changing the world." Marx, we are told, had little or no training in physical science; he once wrote to Engels, "I understand the mathematical laws, but the simplest technical reality demanding perception is harder to me than to the biggest blockheads." He was, however, interested in natural science "because of the close connection of science with industry in the phase of rapidly expanding capitalism." But his chief work lay in the fields of politics and economics, and he attempted to develop a science of society which would embrace all science.

It is claimed here that Marx laid bare the "laws of motion of human history" and made manifest for the first time the basic social character of science. Professor Bernal is an enthusiastic follower and has little patience with those of us who find the going rather hard or unattractive; "it is mental laziness on the part of scientists, many of whom have never even read a line of Marx, to reject it because its philosophic expressions are foreign to the rather naïve levels of thought of natural scientists outside their own specific scientific fields."

The pamphlet closes with some critical comments on science under imperialism and some approval of Soviet science. The author notices a tendency towards mystical and religious belief amongst "respectable" scientists in capitalist countries "just at a time when science, from physics to biology, is deeply imbued with the essentially Marxist idea of historical and dialectical transformation." One reader at least has found the pamphlet singularly unconvincing and marred by over-statement. He is reminded that H. J. Laski once wrote "the error of communism lies in its refusal to face the fact that this is a complex world."

J. TOPPING

Elementary Particles. By ENRICO FERMI. (London: Oxford University Press.) Pp. xii + 110. Price 12*s.* 6*d.*

The subject of elementary particles and their interactions is one which, to the average physicist, represents unexplored territory; and it is the aim of the book under review to open up this subject sufficiently to make it possible for experimental physicists to appreciate some of the principal results that have been obtained. The book is based on the six Silliman Lectures given by the author at Yale University in April 1950, and is intended for readers who have had a good standard University course in quantum mechanics.

In the opinion of the reviewer the book undoubtedly succeeds in giving a broad survey of the aims and methods of that limited band of theoretical physicists who are engaged in the development of field theories; Professor Fermi must be complimented on the fascinating way in which he has presented his subject. It would be presumptuous (if not impossible) for the reviewer to offer any opinions on the merits of the theoretical treatments involved; but it is perhaps fair to say that he was rather disappointed to learn of the extent to which present-day field theories fail to give a good quantitative picture. The chapter headings are: Quanta of a field as particles; Interaction of the fields; The interaction constants; Pions, nucleons, and anti-nucleons. There are five appendixes dealing with various mathematical points in detail.

J. THEWLIS

CORRESPONDENCE

It is opportune that Mr. Peachey's notes on the British Patent System should appear in the *Bulletin* (May 1952) near to the date of the Glasgow Conference, and members would do well to study them. The patent system is a friendly system designed to assist and encourage the wide application of scientific knowledge for the benefit of humanity. Not only does it enable an individual at small expense to gain financial reward for enterprise and initiative in applying his knowledge to solve man's problems, but it can help greatly in the reinforcement and recovery of the nation's economy. We have long lost the leading position of "the world's workshop," but our scientists and technicians still lead the world in technical advances which entitle us to be regarded as "the world's laboratory." The patent system enables this position to be properly exploited. If individual physicists were prepared to give a little thought to commercial exploitation of their ideas (and not be too modest because the ideas are not revolutionary or epoch-making) I think we should see progress of unexpected magnitude. Large organizations already attend to these matters in respect of their employees, but it is suggested that too little attention is paid to patent aspects of inventions by smaller organizations and by individuals, and especially in respect of uses to which an invention might be put beyond its immediate field, or the specific purpose for which it is originated. If Mr. Peachey's notes can turn members' thoughts in that direction they will have served a very useful purpose.

F. W. G. GREENER (*Associate*)

NEWS OF MEMBERS

Fellows

Sir John Cockcroft has been appointed Chairman of the Defence Research Policy Committee, the post which was held, until his retirement, by Sir Henry Tizard.

A. C. Menzies has been elected Chairman of the Optical Group of the Physical Society.

D. Parkinson has been made an Honorary Associate of the College of Technology, Birmingham.

H. L. Penman has been awarded the 1st Prize of the Darton Prizes of the Royal Meteorological Society.

G. D. Robinson has been awarded the Buchan Prize of the Royal Meteorological Society for the period 1947–1951.

E. W. Taylor has been elected to Fellowship of the Royal Society.

Professor S. Tolansky has been elected to Fellowship of the Royal Society.

The following professional appointments have been notified:

K. Hoselitz—Mullard Electronic Research Laboratories, Salfords, Nr. Redhill, Surrey.

Professor J. V. Hughes—Senior Research Physicist, South-West Research Institute, San Antonio, Texas.

J. B. Reid—Head of the Unesco Technical Assistance Team advising the Indian National Documentation Centre, at the National Physical Laboratory of India, New Delhi, India.

Associates

The following professional appointments have been notified:

A. W. Cronshaw—Physicist, British Rayon Research Association, Lancashire.

A. E. Hawkins—Lecturer in Physics, Royal Veterinary College, London.

R. M. Horsley—Scientist II, National Coal Board, Central Research Establishment, Stoke Orchard, Cheltenham.

L. Mandell—Technical Officer, Imperial Chemical Industries Ltd., London.

D. McGill—Head of Science Department, Bradford Grammar School.

G. E. Swindell—Physicist, Northern Ireland Radiotherapy Centre, Belfast.

A. Williams—Lecturer in Physics, Enfield Technical College, Middlesex.

Graduates

The following professional appointments have been notified:

F. M. Herbert—Experimental Officer, Ministry of Supply.

F. D. Morten—Research Physicist, The University of Reading, Berks.

A LETTER FROM THE NEW WORLD

*Members who remember the subtle and amusing note by Mr. E. W. H. Selwyn entitled "How to Write a Mathematical Paper" (*BULLETIN*—October* 1950) *will be particularly interested in the following from his imaginative pen.*

As I told you in previous letters, after getting fixed up with a salaried job, I decided to do a bit of private enterprising on my own and it went very well. Now I need a lawyer. But I reckon you would do. You ought to know enough of what *can* go on in the dark corners of the human mind, after being brought up as a physicist and then spending years in the company of chemists, to be as good as any lawyer for this job. There is money in it if we can pull through. Will you come over and help? What happened was like this.

It all started with an indoor sundial. This was an ordinary sundial, but it worked off an ordinary lamp instead of the sun. Any lamp would do so long as nobody moved it, because it was easy enough to fix up the dial so that it read the right time when it was first set up. After that all that was necessary was to keep the clockwork going that kept the dial turning one revolution per day. It went big for awhile, until everybody changed to floor and table lamps, which not only made the poor dial tell several times at once, but the lamps got moved around too often. We did think of ultra-violet lamps and fluorescent paint, but the market was pretty near saturated so we went in for a machine for playing noughts and crosses. Of course it was a bit heavy to carry to school, but Momma could always get the car out, and we did well enough until the kids found that two machines playing against each other could only reach a draw.

But if you think about it, football is much like a game of noughts and crosses, what with blocking opponents and all, so we had a go at a football-playing machine. This picked up the positions and movements of the players by television, performed the necessary calculations and transmitted instructions to the players on its own side through radio receivers in their headgear. Of course we dared not advertise it, and for a long time we only sold a few. But it was big business, being football.

After that we got down to golf, which up to then could hardly be said to be mechanized at all. It is true that golf clubs were sometimes carried in wheeled carriers. That was soon put right by an internal combustion engine, after which the addition of a seat made it altogether a more comfortable game to play. Then we designed a whammer for striking the ball, the power being supplied by the engine. You might think we had gone far enough, but nothing could stop us. We fixed a television pick-up and hitched to it a direction-finder and a range-finder and used it to operate the whammer. But the top was reached when the television pick-up was made to operate a transmitter. The player could then sit at home in comfort and watch himself play golf. It was good. Busy executives had receivers in their offices.

You would think everybody would be grateful, but were they?

The medical profession, which had always found golf a useful prescription for taking a man's mind off his other ailments has gotten an injunction against us for actions in restraint of trade. It seems that golf played our way won't take a man's mind off anything. That was plenty bad, but worse was to come. The football machine had got around most everywhere (we had begun selling on hire-purchase when the market opened up) and now visiting teams don't even take their own machines with them, because the most progressive grounds have one at each end of the grid-iron. The games are a bit dull to watch, but the Commies have been congratulating us with dialectic stuff about the Marxian democratic function of science being the spreading of equality. There is talk in Washington of another committee to investigate un-American activities.

So for Pete's sake come and get me outa here!

THE REGISTER

ELECTIONS TO MEMBERSHIP

An asterisk (*) indicates transfer from another grade.

Fellows

*Boag, John Wilson, B.Sc., Physicist, Medical Research Council, London.

*Heath, Horace Richard, B.Sc., Ph.D., Head of Physics Department, Battersea Polytechnic, London.

Thyer, Robert Francis, B.Sc., Supervising Geophysicist, Bureau of Mineral Resources, Melbourne, Australia.

*Whitmore, Edward John, B.Sc., Ph.D., A.R.C.S., D.I.C., Assistant Chief Engineer, Vacuum Physics Laboratory, Ferranti Ltd., Edinburgh.

Associates

Bainbridge, Gilbert Ronald, B.Sc., Lecturer in Physics, Technical College, Sunderland.

*Campbell, James Gordon, B.A., M.Sc., Research Scholar, University of Melbourne, Australia.

Clutterbuck, Margery Winifred, B.Sc., Experimental Assistant, General Electric Co. Ltd., Wembley.

Deighton, Richard, B.Sc., Experimental Officer, Radar Research and Development Establishment, Ministry of Supply, Malvern.

Draycott, Leonard Thomas, B.Sc., Master-in-Charge, Lower School of Wintringham Grammar School, Grimsby.

Gladwin, Arthur Sullivan, B.Sc., Ph.D., A.M.I.E.E., Lecturer in Natural Philosophy, Royal Technical College, Glasgow.

Goldman, Gershon Reuben, B.Sc., Lecturer in Physics, Melbourne Technical College, Australia.

Harries, Wynford Lewis, B.Sc., Research Student, University of Oxford.

Hughes, Hugh, B.Sc., Ph.D., Research Assistant, United Steel Co. Ltd., Sheffield.

*Kell, Robert Christopher, B.Sc., Scientific Staff, General Electric Co. Ltd., Wembley.

Kilby, Walter Frederick, B.Sc., Research Physicist, Textile Research Division, Dunlop Rubber Co. Ltd., Birmingham.

Knight, Philip Henry, M.Sc., Lecturer in Physics, Northern Polytechnic, London.

*Layton, Denis Noel, M.Sc., A.R.C.S., D.I.C., Research Student, Imperial College of Science and Technology, London.

Nicholls, Edward Barrass, B.Sc., Geophysicist, Geophysical Prospecting Co. Ltd., London.

Place, James Alfred, B.Sc., Deputy Head of Rolling Mill Research Laboratory, British Iron and Steel Research Association, Sheffield.

*Thomas, David Eric, B.Sc., Ph.D., Research Physicist, Aluminium Laboratories Ltd., Banbury.

Thomas, Gwilym, B.Sc., Technical Officer, Imperial Chemical Industries Ltd., Stevenston.

Vincent, Charles Holmes, M.Sc., Temporary Assistant Lecturer, University of Birmingham.

Watts, Bernard Nelson, B.Sc., Physicist, British Thomson-Houston Co. Ltd., Rugby.

Graduates

Antell, George Richard, B.Sc., Research Trainee, Metropolitan-Vickers Electrical Co. Ltd., Manchester.

Bishop, Peter Harold Howard, B.Sc., Assistant Experimental Officer, Royal Aircraft Establishment, Farnborough.

Brookes, Frederick Reginald, B.Sc., Assistant Experimental Officer, Ministry of Fuel and Power, Safety in Mines Research Establishment, Derbyshire.

Burton, Peter Lennox, B.Sc., Engineer, English Electric Co. Ltd., Luton.

Graham, Ian James Alastair, B.A., Nuffield Foundation Research Scholar, National Gallery, London.

Humphries, Alan Raper, B.Sc., Research Physicist, Manchester Oil Refinery, Manchester.

Quartly, Charles John, B.A., Research Physicist, Kodak Ltd., Harrow.

Jones, Thomas Griffith, B.Sc., Assistant Physicist, British Celanese Ltd., Spondon.

Kaiser, Henry, B.Sc., Assistant Master, Falmouth Grammar School.

Lee, Peter, B.Sc., Assistant, Harrow Technical College.

*McNair, Archibald, B.Sc., Research Student, University of Glasgow.

Mellors, Harry, B.Sc., Instrument Physicist, Birmingham Division of West Midland Gas Board.

*Milton, John Francis, B.Sc., Scientific Officer, H.M. Underwater Detection Establishment, Portland.

Murcott, Neville, B.Sc., Research Assistant, Imperial College of Science and Technology, London.

*Prentice, Thomas Robert, B.Sc.

*Rose, Hyman, B.Sc., Research Student, Cavendish Laboratory, Cambridge.

*St. Aubyn, John Dennis, B.Sc., Editorial Department, Institution of Electrical Engineers, London.

Standring, James, B.Sc., Scientific Officer, Division of Atomic Energy, Ministry of Supply, Culcheth.

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Gibbs, Harry Gordon, College of Technology, Birmingham.

Keenan, Thomas Campbell, Northern Polytechnic, London.

Johnston, Robert, University of Glasgow.

Kent, Thomas Brian, University College of Durham.

Samson, James Alexander Ross, University of Glasgow.

Spencer, John Anthony, Bradford Technical College.

MacFarlane, Neil, Royal Technical College, Salford.

Manuel, John Anthony, Chelsea Polytechnic.

Titley, Timothy, College of Technology, Birmingham.

Wales, Ian Malcolm, Brighton Technical College.

Whitehead, David Montagu, Northern Polytechnic, London.

Vulkan, George Hans.

APPOINTMENTS VACANT

The inclusion of particulars of a vacancy must not be taken to imply that the Institute necessarily approves of the terms offered or that might be offered. Candidates should satisfy themselves that these are satisfactory, and they may always refer to the Institute for advice.

Imperial Chemical Industries Limited, Dyestuffs Division, has vacancies for a number of **physicists** in the Research Department, Manchester. The duties involve the application of modern physical techniques to problems arising in the organic chemical industry. The range of physical problems referred to is very large, with opportunities for suitable men to specialize. One post concerns the application of rheological principles in manufacturing processes. Salaries in accordance with qualifications and experience.

Men under 30 years of age with Ph.D. or good honours degree in physics who are interested should write to the Staff Department, Hexagon House, Blackley, Manchester 9.

Monmouthshire Education Committee. **Technical College of Monmouthshire, Crumlin.** Required to commence duties at the beginning of Summer Term, or as soon as possible afterwards, **Assistant** to teach physics with some mathematics.

Candidates must hold good honours degree in physics, or its equivalent, plus industrial, research and/or teaching experience. A share of advanced work will be given to suitably qualified persons and facilities for research provided.

Salary in accordance with Grade A Scale for Assistants. £375 × £18–£630. Position on scale according to qualifications and experience.

Forms of application, etc., obtainable from the Director of Education, County Hall, Newport, Mon., must be returned not later than June 25th.

University of Melbourne, Australia, invite applications for the position of **Professor of Theoretical Physics,** a specialist in quantum mechanics being desired. Salary £A2,036 per annum (including £A186 cost of living allowance). Superannuation is similar to F.S.S.U. and policies under F.S.S.U. may be transferred.

Further particulars and information as to the method of application should be obtained from the Secretary, Association of Universities of the British Commonwealth, 5 Gordon Square, London, W.C.1. The closing date for the receipt of applications is August 31, 1952.

Physicist required by the **British Iron and Steel Research Association** for work on X-ray crystallography, Geiger counter techniques, etc. Applicants should have a good degree in physics. Some research experience an advantage. Age range 21–28. Salary according to age, qualifications and experience. Location of work, Swansea. Written applications only to Personnel Officer, B.I.S.R.A., 11 Park Lane, London, W.1.

Assistant required for research work in connection with the marine transport of refrigerated cargoes. The work is mainly physical in character and will involve a certain amount of work at various ports. Applicants should have Inter. B.Sc. or equivalent qualification and have completed National Service. Salary will be according to experience within the range £350–£500 per annum. Apply in writing to Technical Director, **Refrigerated Cargo Research Council,** Falcon Yard, Cambridge.

Development Engineer and **Assistant Technician,** preferably with honours degrees and research experience, required for work on thermometry, thermostats and control instruments, etc. Salary commensurate with qualifications. Please give full details as to age, experience, etc. Please apply to Box No. A.V. 24, The Institute of Physics, 47 Belgrave Square, London, S.W.1.

The United Nations Educational, Scientific and Cultural Organisation invite applications for the post of **Professor of Physics,** Head of Department of Physics, College of Arts and Science, Baghdad, Iraq. The duties will be (1) to direct the execution of the schedule proposed for physics by the Science Curriculum Committee; (2) teach elementary and advanced courses in physics; (3) organize the teaching in laboratories and correlate it to lectures and assist in planning the future University Laboratory; (4) conduct a seminar to keep research interest alive among the physics teachers and students of all the colleges of Baghdad; (5) plan and conduct research. The research work should preferably be of aid in the technical development of Iraq. The X-ray diffraction Unit may form the basis of a research laboratory. Qualifications: the candidate must hold a University degree of high level (Ph.D. or equivalent), and have had many years experience in teaching and research, preferably acquired in conditions similar to those to be encountered. Salary between £2 150–£2 560 per annum according to qualifications and experience, free of income tax, plus an allowance covering the first month and thereafter a daily lodging allowance; free outward and return passages for the appointee and, as appropriate, his dependants.

Application forms and further information obtainable from the Ministry of Labour and National Service, Technical and Scientific Register (A.S. 12), Almack House, King Street, St. James's Square, London, S.W.1, quoting A12/UNE/118/52.

Northern Polytechnic, Holloway, London, N.7. The Governing Body invite immediate applications for appointment as **Senior Lecturer in Physics** to teach up to B.Sc. (Special) degree standard. Person appointed will be expected to offer special qualifications in some branch of physics and to engage in research. Salary scale: Men £1 000 × £25 × £1 150: Women £800 × £20 × £920, plus London allowance. Form of application, together with full particulars, will be forwarded on receipt of a stamped addressed foolscap envelope.

The Morgan Crucible Co. Ltd., is increasing the staff of its Central Research Department to keep pace with the rapid development of its wide range of products, particularly those made from carbon, graphite and refractory materials. There are vacancies in the following categories:—

Senior administrative position for man aged approximately 35 with good honours degree in physics. Broad scientific background and industrial experience essential. Experience in engineering and the testing of materials desirable but not essential. (Reference 6.)

Research Physicist aged about 25 with degree in physics. Industrial research experience an advantage. (Reference 7.)

First-class conditions, staff canteen, five-day week with all welfare and recreational facilities. All positions are permanent and pensionable.

Write quoting reference and giving details of age, experience, qualifications and salary required to the Staff Manager, The Morgan Crucible Co. Ltd., Battersea Church Road, S.W.11

The University Court of the University of St. Andrews invites applications for appointments as **Assistant** in the Department of Physics in **University College, Dundee.** The salary attached to this appointment is £450 per annum together with F.S.S.U. benefits. The appointment will be renewable annually subject to a maximum tenure of three years. One copy of the application along with testimonials and/or the names of three referees should be lodged with the Secretary, D. J. B. Ritchie, The University, St. Andrews, not later than 16th June, 1952.

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